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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MULLER, BRYAN R

ART UNIT PAPER NUMBER

3723

DATE MAILED: 11/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/676,643

Applicant(s)

KIM, WAN SHICK

Examiner

Bryan R. Muller

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2,3 and 5-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2,3 and 5-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's petition to withdraw the requirement for election of species dated 9/24/2004 has been granted. Thus, the current office action is on the merits of presently pending claims 2, 3 and 5-10.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 7-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Although it is unclear what the applicant is intending to claim in claims 7-10, as discussed below in the 112, 2nd paragraph rejections, it is best understood by the examiner that the applicant is trying to claim that the slurry is more dense and has more particles when there is more diluent solution supplied and less slurry supplied. The applicant fails to provide an explanation for how this is possible, when it would be inherent that a larger amount of diluent solution would provide a lower density and lesser amount of particles and a smaller amount of slurry added to a diluent solution would also provide a lower density and lesser amount of particles.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 3 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear how a solution with the same composition as the slurry solution could act as a diluent to the slurry solution. If the same composition were added to the slurry solution, the slurry solution would not be diluted in any way.

6. Claims 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what the applicant is intending to claim with the statements that "the density of the slurry and the amount of particles in the slurry are calculated to be higher in proportion to an amount of diluent solution". It is unclear if the applicant is intending to claim that the slurry is more dense and has more particles when there is more diluent solution added to the slurry, which would not be possible when the diluent solution is pure water because the water contains no abrasive particles and would inherently make the slurry less dense and have less particles as more water is added to the slurry, or if the applicant is intending to claim that the diluted slurry has a higher density and a higher number of particles than an amount of the diluent solution, which is inherent when the diluent solution is pure water because the water has no particles and is, thus less dense than the slurry.

7. Claims 9 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what the applicant is intending to claim with the statements that "the density of the slurry and the amount of particles in the slurry are calculated to be higher in inverse proportion to an amount of supplied slurry". It is unclear if the applicant is intending to claim that the slurry is more dense and has more particles when there is less slurry added to the diluent solution, which would not be possible when the diluent solution is pure water because the water contains no abrasive particles and would inherently make the slurry less dense and have less particles as more water is added to the slurry, or if the applicant is intending to claim that the diluted slurry has a higher density and a higher number of particles than an amount of the supplied slurry, which does not seem to be possible because the diluent slurry is **diluted** and, thus must have a lower density and lesser amount of particles.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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9. Claims 2, 3, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farkas et al. (5,710,069) in view of Cerni et al. (6,275,290) and Kondo et al (2002/0061722 A1).

10. In reference to claim 2, Farkas discloses an apparatus for measuring slurry particle size during substrate polishing that comprises a pump (13) (slurry supply unit) that controls flow of the slurry through a supply line (12), into an analytical section (14) and out to the work piece in a CMP (chemical-mechanical polishing) tool (15). The analytical section analyzes a cross-section (26, col. 3, line 52) and comprises a light source (17), a photodetector (16) and a computer (20) to control the light source, interpret data and accurately calculate the overall distribution of particles in the mixture (density) (col. 2, line 65 – col. 3, line 3). The pump acts as the claimed slurry supply unit and is controlled by the computer (step 59) to start or stop the pump based on the particle size and density of the slurry (col. 6, lines 28-41). The light source and photodetector act as a photo image sensor because they use light to produce and detect an image of the slurry in the detection cross-section (26). However, Farkas fails to specifically disclose a slurry injection nozzle, but does disclose that the slurry is supplied to the work piece of a CMP tool, and it is commonly known in the art that a nozzle may be used to supply slurry to a work piece accurately during the CMP process. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to provide a nozzle to supply the slurry to the substrate in order to control the slurry and make application of the slurry more accurate. Farkas also fails to disclose that the photo image sensor is to be located on a bypass diverged from the

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slurry supply line or that the apparatus comprises a diluent solution supply unit to supply diluent solution into the bypass to reduce a concentration of particles in the slurry.

Cerni discloses a quality control process for a particle size distribution measuring system for CMP polishing slurries that comprises a photo image sensor, similar to the one disclosed by Farkas that detects particle size and density of slurry during real-time operation. Cerni further discloses a bypass diverged from the main supply line that passes a portion of the slurry through a cross-section to be monitored and analyzed by the photo image sensor (fig. 3). Providing this by-pass from the main line prevents the system from interfering in any way with the slurry supply or the running of the

apparatus. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to provide a by-pass diverging from the slurry supply line of Farkas and relocate the photo image sensor along this by-pass to prevent the sensor from interfering with the main slurry supply flow or the operation of the CMP apparatus.

Kondo discloses an apparatus for producing and feeding a polishing solution that uses a photo image sensor (a light or scattered light and measured light intensity) to determine the slurry density (number of abrasive grains contained in the solution) and teaches that the polishing solution must be diluted with pure water to provide an accurate reading for the density of the polishing solution (paragraph 3). Therefore, it would also have been obvious to one of ordinary skill in the art at the time the invention was made to provide the apparatus of Farkas with a diluent solution supply unit to dilute the slurry to provide an accurate density measurement, as taught by Kondo. It would have further been obvious to provide this diluent solution supply unit to the bypass, because the

measurements are taken at the bypass and, thus the slurry passing through the bypass must be diluted to achieve accurate density measurements.

11. In reference to claim 3, it would be obvious that the diluent solution should be pure water, as taught by Kondo.

12. In reference to claim 5, it would further be obvious that the method of controlling slurry flow using the apparatus obviously disclose by the Farkas, Cerni and Kondo combination would comprise supplying slurry to the slurry injection nozzle through a slurry supply line, introducing slurry into a by-pass diverged from the slurry supply line, supplying a diluent solution into the by-pass to reduce a concentration of particles of the slurry, capturing a cross-sectional image of the by-pass to measure the sizes of particles included in the slurry and the density of the slurry and controlling supply of the slurry based upon the measured sizes of particles and density of slurry.

13. In reference to claim 6, it would be obvious that the diluent solution should be pure water, as taught by Kondo.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kilham (5,191,388) discloses a photo image sensor apparatus for analyzing particulate matter in slurry flow, Choi et al. (2003-036970) discloses a method for measuring density and particle size in a slurry using ultraviolet light, Lawton (6,347,976) discloses a common CMP system the uses sensors to determine operating

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properties of the system to control the system and uses a nozzle to supply the slurry to the substrate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bryan R. Muller whose telephone number is (571) 272-4489. The examiner can normally be reached on Monday thru Thursday and second Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph J. Hail III can be reached on (571) 272-4485. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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11/1/2005

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